

Remarks

Claims 1-11 are pending in the present application. Claims 1 and 7-11 are amended, herein for clarification. No new matter has been entered.

Objection for Informalities

Claims 1, and 7-11 were amended to delete the word "nitrogen" before "nitrogen-containing precursor". Accordingly, the typographical errors in the claims have been deleted, and the objection for informalities should be removed.

Rejection under § 112, ¶ 2

Claims 1-11 were rejected under § 112 based on the examiner's assertion that the recited term "flat" is indefinite. For example, each independent claim includes a recitation similar to that found in claim 1 (emphasis added):

“... forming an upper electrode layer over said reoxidized layer,
wherein **a substantially flat temperature distribution** is
maintained across said semiconductor substrate ...”

Given the context of a temperature distribution, or any distribution of values, the term “flat” may be understood with reference to the definitions presented in Merriam-Webster's Collegiate Dictionary, 10th Edition: a number of readily available sources. For example “dictionary.com” defines “flat” as follows:

flat *adj.* **flat-ter, flat-test**

“... being or characterized by a horizontal line or tracing without peaks or depressions”

“arranged or laid out so as to be level or even.”

Similarly, the internet reference found at www.thefreedictionary.com defines the term “flat” in the following manner:

“Of or relating to a horizontal line that displays no ups or downs
and signifies the absence of physiological activity.”

Accordingly, applicant’s respectfully submit that the term “flat,” as is recited in the context of claim 1 and the other independent claims is definite and clearly defines a temperature distribution lacking substantial “peaks or depressions” and “ups and downs” across the surface of the semiconductor substrate. As such, the “flat” temperature would be represented as a substantially horizontal line as plotted in one dimension across the surface of the substrate, or as an even plane when plotted in two dimensions across the surface of the substrate.

Applicants acknowledge that a variety of definitions are given for the term “flat” in most sources. However, a cursory review of these definitions reveals the fact that the term “flat” is used in a variety of contexts outside the scope of the present invention, i.e., musical notes, painted surfaces, film developing, nautical navigation, etc. One may readily eliminate the definitions that relate to contexts clearly outside the scope of the present invention to arrive at the clear scope of the term as it is used in the context of the present invention - a spatial temperature distribution across the surface of the substrate that lacks substantial “peaks or depressions” and “ups and downs.”

Rejection under § 103(a)

The independent claims of the present application have been rejected under 35 U.S.C. §103, primarily in view of a reference (Lee et al.) that teaches an ALD method where the reaction chamber is maintained at a temperature of about 450°C. According to the comments accompanying the Advisory Action of March 1, 2006, for the purposes of the obviousness rejection, the rejection of the claims reciting the “substantially flat temperature distribution” is proper merely because the reference does not expressly state that the temperature varies across the surface of the substrate. According to the Advisory Action, “nowhere in Lee does it state

that the temperature in the reaction chamber is changed” and “absent evidence to the contrary, it stands to reason that ... the temperature across the substrate is maintained” at a constant value of 450°C.

Attached hereto is an October, 2002 publication from Science, entitled “Rapid Vapor Deposition of Highly Conformal Silica Nanolaminates.” The publication is authored by Hausmann et al. and teaches an ALD process that is “substantially immune to variations caused by nonuniform distribution of vapor or temperature in the reaction zone (see page 403, column 1).” Accordingly, the publication clearly shows a recognition in the art that ALD processes are commonly characterized by nonuniform temperature distributions in the ALD reaction zone. According to the present invention, which pre-dates the October 2002 Science publication, problems introduced by the nonuniform temperature distributions in ALD processes are addressed directly by maintaining a “substantially flat” temperature distribution across the substrate in the ALD chamber. Accordingly, applicants respectfully submit that they have introduced evidence showing that, absent direct control of temperature distributions, ALD deposition processes are commonly characterized by varying temperature distributions in the reaction chamber. This particular evidence was expressly called for in the Advisory Action of March 1, 2006, and shows that the Lee et al. ALD process is not necessarily characterized by a flat temperature distribution across the surface of the substrate. As such, applicants submit that the rejection of each independent claim under 35 U.S.C. §103 in view of Schuegraf and Lee et al. is lacking in that it fails to set forth a teaching or suggestion that a substantially flat temperature distribution be maintained across the substrate surface during ALD.

Double Patenting Rejection

Regarding the rejection of claims 1-11 under the judicially created doctrine of obviousness-type double patenting, applicants refer to the terminal disclaimer filed on February 7, 2006 in response to the Office Action of January 10, 2006.

Serial No.: 10/790,492
Docket No.: MIO 0082 N2/40509.292

Conclusion

The Applicants respectfully submit that, in view of the above amendments and remarks, the application is now in condition for allowance. The Examiner is encouraged to contact the undersigned to resolve efficiently any formal matters or to discuss any aspects of the application or of this response. Otherwise, early notification of allowable subject matter is respectfully requested.

Respectfully submitted,

DINSMORE & SHOHL LLP

By /James E. Beyer/
James E. Beyer
Registration No. 39,564

One Dayton Centre
One South Main Street, Suite 1300
Dayton, Ohio 45402
Telephone: (937) 449-6400
Facsimile: (937) 449-6405